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ABSTRACT

College students experiencing academic difficulties are a major concern to universities. Research has indicated that many underachievers display certain identifiable electroencephalogram (EEG) characteristics. Unlike achieving students, underachievers often exhibit little EEG arousal during normally motivating tasks. These findings suggest that many underachievers may not have the same ability to concentrate as achieving students. Research in EEG biofeedback training has posited that these patterns may be altered by training. Underachieving university students (N=20) were randomly assigned to one of three groups: EEG biofeedback training, temperature biofeedback training, or no training. Students in the EEG group participated in 8 30-minute biofeedback sessions in which they received immediate feedback on changes in alpha production while studying. The temperature group was given auditory feedback of changes in finger temperature while studying during the sessions. Grade point averages (GPA) were determined before the sessions and again at the end of the semester. Results did not reach statistical significance, but consistent trends were found. The greatest change in GPA occurred in the EEG group, as did the highest percentage of students with an increase in GPA. The mean GPA of students in the "no training" group decreased during the semester. The results suggest that EEG characteristics may provide diagnostic information about reasons for underachievement. (NRB)

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Biofeedback Training and Underachievement: A Preliminary Investigation

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A group of students causing concern at most colleges and universities are those students having academic difficulty. These students are especially likely to leave school, either because they flunk out, or because of dissatisfaction with their college experience. Their difficulty may be due to any of a number of factors, including emotional immaturity, poor study skills, lack of a goal or purpose in attending college, and a variety of others. Many colleges and universities have been attempting to provide services appropriate to these various concerns.

Research has indicated that many underachievers (those students whose grade point average is below their potential GPA) display certain identifiable electroencephalogram (EEG) characteristics (Bry & Daniel, 1967). Specifically, academic underachievers exhibit little EEG arousal during normally motivating tasks. Rather than shifting to an EEG pattern that reflects mental activity or concentration, as is the case with achieving students, the underachiever's EEG often continues to reflect a state of relaxation, and displays a significantly more persistent alpha state. This finding is consistent with personality studies of underachievers, which often describe them as difficult to motivate, emotionally inhibited, underreactive, and nonattentive.

These findings suggest that many underachievers may not have the same ability to concentrate that achieving students may possess. The wealth of research in EEG biofeedback training suggests the possi-

bility that these patterns may be altered by training.

Most EEG feedback training studies have attempted to train subjects to increase alpha production. Since underachieving students typically display more persistent alpha than achieving students, it is very likely that this type of training would not be helpful for this group. Mulholland (1974) suggests that alpha blocking using visual feedback may be useful in increasing visual attention. The present study is intended to investigate the potential benefit of biofeedback training for underachieving students.

Method

Student volunteers were solicited from various university classes. Based on information from the university admissions office, underachieving students were selected from this group of volunteers. Underachievement was defined as a cumulative GPA below the predicted GPA for the student. The students were not told the basis for their selection as subjects. The resulting group of 20 was randomly assigned to one of three groups: 1) EEG biofeedback training; 2) temperature biofeedback training; or 3) no training.

Students in the EEG training group participated in eight 30 minute biofeedback sessions, scheduled at weekly or twice weekly intervals. During these sessions, alpha production was monitored while the student was studying his or her own materials. Feedback was provided to

the student by a desk lamp which remained "on" as long as alpha production stayed below a preset threshold. Thus, the student received immediate feedback on changes in his or her alpha production while studying. They were told to keep the light on as much as possible.

While temperature biofeedback training was not seen as directly related to underachievement, it was included to investigate any "placebo" effects of a supposedly irrelevant intervention. Students in this group were provided auditory feedback of changes in finger temperature while studying during eight 30 minute sessions.

Results

Grade point averages were determined again at the end of the semester in which the training occurred. The results are presented in Table 1.

Insert table 1 about here

While the results do not reach statistical significance, there are some consistent trends in the data. The greatest change in GPA occurred in the group recieving EEG biofeedback training, as did the highest percentage of students with an increase in GPA. The mean GPA of students in the "no training" group decreased during the semester.

Several students in the EEG training group reported that they were better able to "catch themselves daydreaming" while studying outside the training sessions.

Discussion

The results of this preliminary study are encouraging enough to justify further investigation with larger sample sizes. Follow-up of grades beyond the semester in which training occurs would be desirable in order to assess long term effects. In the present study, biofeedback training was begun about a third of the way through the semester, so some of the basis for the semester grades had already been established before any intervention was initiated. It is possible that the increase in GPA would be more substantial in subsequent semesters. The similarities and differences between EEG and temperature biofeedback training effects deserves further investigation. The effects of varying the length and frequency of training could be examined. Selection of subjects could be made by other methods, such as personality or study methods evaluations. To avoid any effects of self-selection, mandatory participation by students on academic probation may be considered.

In addition to being a useful remedial technique, there is the potential for EEG characteristics to provide diagnostic information regarding the reasons for underachievement. If a student in academic difficulty displays persistent alpha during a task requiring visual attention,

biofeedback training may be a useful adjunct to counseling, vocational guidance, or training in study methods.

References

Bry, Brenna H., & Daniel, Robert S. The unresponsive EEGs of college underachievers. Psychonomic Science, 1967, 9(2), 103-104.

Mulholland, Thomas B. Prospects for training visual attention with feedback electroencephalography. Paper presented to Friends of the Sensorially Deprived, Belmont, Massachusetts, January 30, 1974.

Table 1

Change in GPA With Biofeedback

Type of biofeedback training	n	Mean GPA change[a]	% of students with GPA increase
EEG	8	.19	88
Temperature	6	.13	67
No training	6	-.22	33

[a]GPA measured on a 4-point scale.